



In addition to part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **EEE F111**
Course Title : **ELECTRICAL SCIENCES**
Instructor-in-charge : **NILANJAN CHATTARAJ (nilanjan.chattaraj@pilani.bits-pilani.ac.in)**
Team of Instructors : **Ananthakrishna Chintanpalli, Arnab Hazra, Asutosh Kar, Kusum Lata, Navneet Gupta, Pawan K. Ajmera, Pramila Mahala, Praveen Kumar A V, Puneet Mishra, Sainath Bitragunta, Subhashis Gangopadhyay, Surekha Bhanot**

- Course Description:** Course covers Basics of electrical circuit elements, Kirchoff's law, Network analysis and Network theorems, Transient analysis of first order and second order circuits, Semiconductors and diodes, Basic operation and characterization of transistors (BJT and FET), Basics of operational amplifiers and its application, AC circuit analysis, Frequency response, Filters, Magnetic circuits and B-H curves, Transformer, Overview of electrical machines.
- Scope and Objective of the course:** The principal objective of this course is to teach the principles of three different aspects of electrical sciences (1) Circuits (2) Electronics and (3) Electromagnetics to the student composed of mixed disciplines.
- Text Book:**
Leonard S. Bobrow and Navneet Gupta, Foundations of Electrical Engineering, Oxford University Press, Asian Edition, 2015.

Course Plan:

Module	Lec	Coverage	Ref. (TB)	Learning Outcome
Basic elements and laws	1-2	Voltage and current sources, basic circuit components, Kirchoff's current law (KCL), Kirchoff's voltage law (KVL), Instantaneous power, Inductors, Capacitors	1.1-1.7	Students will learn basic circuit elements and the laws of electrical science to solve basic electrical circuits
	3	Independent and dependent sources, Source transformation	1.8	Students will learn independent and dependent sources, source transformation
Circuit analysis principles	4-5	Nodal analysis, Mesh analysis	2.1-2.3	Students will be able to solve circuits by nodal and mesh analysis
	6-8	Network theorems (Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Superposition theorem)	2.4,2.6	Students will be able to solve circuits using network theorems.
Time domain analysis	9-12	Transient response of first and second order circuits (natural and forced response)	3.2-3.5	Students will be able to perform time domain analysis of first and second order circuits.
AC analysis	13-14	Time-domain analysis, Waveforms, form factor, Phasor representation of alternating quantities, j operator and Phasor algebra, Frequency-domain analysis	4.1-4.3	Students will learn concept of phasor, phasor algebra, frequency domain analysis of AC circuits.





	15-17	Average power, apparent power and complex power	4.4-4.5	Students will learn concepts of power in AC circuits.
	18-19	Three phase circuits (Y and Δ connections)	4.6	Students will learn concepts of three phase circuits (Y and Δ connection)
Frequency response and resonance	20-22	Frequency response, Filters (Low Pass, High Pass and Band Pass), Resonance and Quality factor	5.1-5.2	Students will be able to perform frequency domain analysis of circuits and learn resonance and filters.
Diodes	23-25	Basics of semiconductors, PN junction, Junction diode, Ideal diode and applications (rectifiers and clippers)	6.2, (partly) 6.3,6.4,	Students will study basics of semiconductors, diodes and their use in various electronic circuits.
	26-27	Zener diode (its model and application as voltage regulator and clipper)	6.6	Students will learn applications of zener diodes in electronic circuits.
Bipolar Junction Transistors	28-30	Basic operation and characteristics of BJT	7.1-7.3	Students will learn the construction and operation of bipolar junction transistors
Field-Effect Transistors (FET)	31-33	Operation and characteristics of JFET and MOSFET	8.1-8.2	Students will learn construction and operation of field effect transistors
Operational amplifier	34	Basics of operational amplifier and its application	10.1	Students will learn opamp circuits and their applications
Magnetic circuits and transformers	35-36	Analogy between electrical and magnetic circuits, B-H curves	13.1-13.2 (partly) 13.3, 13.4	Students will learn the fundamental concept of electromechanics, magnetic circuits and transformers.
	37-38	Lenz's law, Transformers, Ideal transformer	13.8, 13.9	Students will learn basic concepts of transformers, ideal transformer
Introduction to machines	39-40	Basics of rotating machines	15.1-15.2 (partly)	Students will learn physical structure and operation of DC/AC machines

4. Evaluation Scheme:

S No.	Evaluation Component	Duration	Marks (300)	Weightage	Date & Time	Nature of Component
1.	Mid-Sem Test	90 min.	105	35%	7/3 11:00 - 12:30 PM	Open Book
2.	Surprise quiz	20 min	60	20%	During Common Hour	Closed Book
3.	Comprehensive	3 hrs.	135	45%	5/5 AN	Closed Book

5. **Chamber Consultation Hour:** Will be displayed on Nalanda.

6. **Course Notices:** All notices of this course will be displayed on the **Nalanda only**

8. **Make-up Examination:** No make-up will be given for surprise quizzes, however for other components; make-up will be given **ONLY** in cases of **sickness (hospitalization)** or **urgency** for going out of station. In such case student must produce the sufficient proof or must have taken the prior permission from the IC.

Instructor-in-Charge



